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## A lectotype for *Dinapate wrightii* Horn, the giant palm-borer, and description of a new species of *Dinapate* from eastern Mexico (Coleoptera: Bostrichidae)

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**Abstract.** A lectotype is designated for *Dinapate wrightii* Horn. It is emphasized that Horn's type series consists entirely of fragmentary, disarticulated specimens from which Horn drew a composite description. Only three of these very imperfect syntypes appear to have been preserved. A second species (*Dinapate hughleechi* new species) has been found infesting palms [*Sabal texanum* (Cook) Becc.] in east-central Mexico. Its description, secondary sexual characteristics, and taxonomic separation from *D. wrightii* are presented.

**Resumen.** Un lectotipo para *Dinapate wrightii* Horn, el baranillo gigante de las palmeras y una descripción de una nueva especie de *Dinapate* del este de México (Coleoptera: Bostrichidae). Un lectotipo está designado por *Dinapate wrightii* Horn. Se nota que el tipo Horn consiste solamente de especímenes fragmentarios y desarticulados de los cuales Horn inferió una descripción compuesta. Parece que solamente tres de estos sintipos se han preservados. Un segunda especie (*Dinapate hughleechi* new species) se ha encontrado infestando palmas [*Sabal texanum* (Cook) Becc.] en el este-central de México. Su descripción, sus rasgos sexuales secundarios y la separación taxonómica de *D. wrightii* se exponen en el texto.

### INTRODUCTION

*Dinapate* (Horn 1886a) until now has been a monotypic genus, with its sole species a subject of unusual interest and speculation ever since its discovery. It was set apart on morphological grounds from other bostrichids within a tribe Dinapatinae (Lesne 1910), later the subtribe Dinapatina (Lesne 1938), of which it has remained the sole representative. Generic diagnoses are to be found in Horn (1886), Lesne (1909) and Fisher (1950).

In keeping with its taxonomic isolation, there are distinctive aspects of its biology. Almost all bostrichids are polyphagous, feeding upon ligneous tissues of a wide range of plants (Lesne 1911). Few bostrichids attack living plant tissue, and only 5 other species among the 400-500 known Bostrichinae include palms or their parts among the beetles' ordinarily diverse sources of food (Lepesme 1947). *Dinapate wrightii* is, therefore, markedly unusual among bostrichids. Not only does it regularly attack living palms, but it would appear unique by being restricted in its development to but one species, the California Fan Palm, *Washingtonia filifera* Wendl. (Baker 1971). The known distribution of *D. wrightii*, southern California to Cataviña in Baja California Norte (Michelbacher and Ross 1939), lies entirely within the natural range of *W. filifera*. *Dinapate* is also the giant among bostrichids, by far the largest known, up to 60 mm+ in length from the anterior margin of the pronotum to the apices of the elytra. It thus reaches nearly twice the length and 6.6 times the volume of the second largest bostrichid, *Apate terebrans* Pallas (to 32 mm, Lesne 1909), a native of tropical Africa and a miner of *Acacia* and its relatives (Lesne 1924).

The purpose of this paper is to designate a lectotype for *Dinapate wrightii* Horn

and to describe a new species of *Dinapate* from eastern mainland Mexico that is also a palm miner. A second study will provide information and new findings on the general biology, host range, and distribution of *Dinapate* species, as well as critical comment on the early history surrounding William Greenwood Wright's discovery of the beetle bearing his name—a paradoxical record.

#### DESIGNATION OF A LECTOTYPE

The George H. Horn collection, Museum of Comparative Zoology, Harvard University, contains three articulated female specimens labelled as follows:

- (1) Lectotype 3560/*Dinapate wrightii* Horn. Moj. Des.;
- (2) Cal./Para-type 3560-2;
- (3) N.J./Horn Coll. H 10,159 [the catalog number in Henshaw's third supplement (1895)].

In addition there is a fourth "mock-up" of *Dinapate wrightii* made from fragments of a male, blackened cork and beeswax, labelled: Para-type 3560-3.

When Horn (1886*a*) described *D. wrightii* he thanked Wright, the collector, "For the fragments in my possession," and his descriptions and illustrations (plate I) were prepared from fragments of "several specimens" (Horn 1885, 1886*a*; see also Schwarz 1899). Among these there were at least more than one representation of the female sex, for he stated "... the smaller specimens are females" (Horn 1886*a*). Where are the remaining fragments to be found of two or more females that Horn possessed?

There are four additional specimens of *D. wrightii* in the John L. Leconte collection at the Museum of Comparative Zoology, necessarily placed there after Leconte's death in 1883 (and most certainly by Horn). Two of these are fragmented. One is a female without labels, consisting of an elytron, abdominal venter, meso- and metasterna, and legs; the other is represented by a pair of male elytra mounted on a beetle-shaped piece of wood on a pin, and is also without labels. Very likely these two are from the sets of fragments from which Horn drew his descriptions and illustrations. I have been unable to discover whether a fourth disarticulated specimen, or still more, attributable to Horn's original series now exists. If so, the specimen or specimens are neither at Harvard nor at the Academy of Natural Sciences in Philadelphia in which Horn's collection was originally housed.

Horn's article appeared in the January 1886 issue of the Transactions of the American Entomological Society, but that issue almost certainly was published at some unrecorded later month. It was in fact first approved for publication on Jan. 28, 1886 as stated in the publication register of the American Entomological Society. It is thus possible that Horn studied, but did not mount, keep, or explicitly mention, additional fragments of the beetle possibly received along with "... the fragment of tree trunk sent several months ago [early in June?] by W. G. Wright" (Horn 1886*b*). Later, in early September of 1886 and certainly *after* publication of Horn's description (for Horn makes no mention there of having seen an intact specimen), an unspecified number of *Dinapate* emerged from the fragment of trunk. With one possible exception, they were females, no more than five or six in number, and assuredly are the only complete specimens mentioned by Horn in his writings. Some of them at least are among the intact specimens in the Horn and Leconte collections. Their possession made it unnecessary for Horn to retain in his collection any fragmented specimens. Why then did he keep "Para-type 3560-3"? Almost certainly that specimen, a male, was the best of those used by Horn when describing *Dinapate wrightii*, and had value to him for that reason.

In any case, the three fragmented specimens mentioned above certainly served as part of Horn's descriptive material and are syntypes, whereas none of the intact specimens in the Horn and Leconte collections so served, nor did the female possessed by the Muséum National d'Histoire Naturelle, Paris, a gift from Horn in 1888. So what is to be made of the specimen in the Horn collection that is in fact labelled: "Lectotype 3560"?

Horn never formally designated a type, and I have been informed (by Mr. P. J. Johnson and through Dr. A. F. Newton, Jr.—*personal communication*) that “When the Horn collection was still in Philadelphia all the unique or first-specimen-of-the-series specimens were labelled with cataloging numbers. Unfortunately the labels used were printed as lectotype labels, and to date no lectotype has been designated.”

For the reasons given, the only specimen of the series now in the Horn collection that contributed to the description of *Dinapate* is the male mock-up bearing the sole label: Para-type 3560-3. That specimen is designated here as the lectotype; the fragmented female and mounted male elytra in the Leconte collection are, accordingly, paralectotypes.

#### A NEW SPECIES OF *Dinapate*

Mr. Hugh B. Leech, commenting in June 1984 on a draft of a manuscript devoted to the biology and history of *Dinapate wrightii*, stated that *Dinapate* is also to be found in eastern, mainland Mexico, about 1040 km E of Baja California, where he and Dr. E. S. Ross had dug a partially disarticulated female from a palm log. That specimen appears very similar to the female of *D. wrightii* insofar as the remains are concerned, but differs noticeably by having an unusual amount of long hair on the frons. Then, on Dec. 6, 1984, Dr. Ross Arnett informed me that specimens of *Dinapate*, collected in 1965 from eastern Mexico and thought to be a new species, are in the Florida State Collection of Arthropods, Gainesville. Through his kindness, and the generosity of Drs. Robert Woodruff and Eugene J. Gerberg, I have been permitted to examine and study the three female specimens. Finally, and most fortunately, the California Academy of Sciences possesses a *male*, collected by Dr. E. S. Ross in 1946, that I have been permitted to include in this study. The five specimens do indeed represent a species markedly similar in size and general appearance to smaller specimens of *D. wrightii*, yet differ notably in many features that become striking only in aggregate.

The color names having a numerical notation in the following description are represented by color swatches portrayed and described in Smithe (1974–1981).

#### *Dinapate hughleechi* new species (Figures 1A, 1C, 1E, 1I, 1J)

*Description.*—Length (anterior pronotal margin to elytral apex) 35–40 mm; width at humeral umbone 12.7–14.4 mm. Head, body above, legs, palps, scape and funicular joints of antennae dark, blackish to warm sepia (221A); expanded portions of antennal club warm sepia to burnt amber (22); pubescence long and abundant on head, mouth-parts, tibiae, sternum and abdomen, ferruginous-testaceous to buff (24).

Head, including frontal furrow and clypeal suture, similar to *D. wrightii*, except sides of clypeus, frons (especially bordering eyes), and upper occiput with abundant long pubescence (may be diminished or lost with age). Antennae with 8th joint forming a wide angle ( $80^\circ \pm$ ) above, length 10th joint about  $1.8 \times$  greatest breadth (Fig. 1E).

Pronotum slightly wider than long ( $\bar{m}$  w/l = 1.9, range 1.07–1.10), similar to *D. wrightii* with sparse, long pubescence along margins and flanks, strong, rasp-like projections anteriorly and laterally.

Scutellum concave above.

Elytra at humeral umbone broader than pronotum at widest (mean humeral width/pronot. w. = 1.18, range 1.06–1.27); humeral umbone coarsely, deeply wrinkled, incised and reticulated; sides subparallel; surface with 6 low, broad costae, crenulated along lengths by angular, marginal punctures, disposed as in *D. wrightii* (Figs. 1G, 1H), corresponding with the customary main longitudinal tracheae of the coleopterous wing pad: costa 1 (Sc?) subparallel to fluted marginal bead, 2 and 3 (R and M?) arising from below and behind the umbone, 3 very weak, obsolescent along most of length, 4 (Cu?), 5 (PCu?), and 6 (“A”), the sutural costa; costa 2 terminates below the outer broad tumidity (“outer tubercle”) above the declivity, and 3 and 4 terminate on that eminence (Figs. 1G, 1H); 1 and 2 contact and then diverge in apical third (Fig. 1H), basally

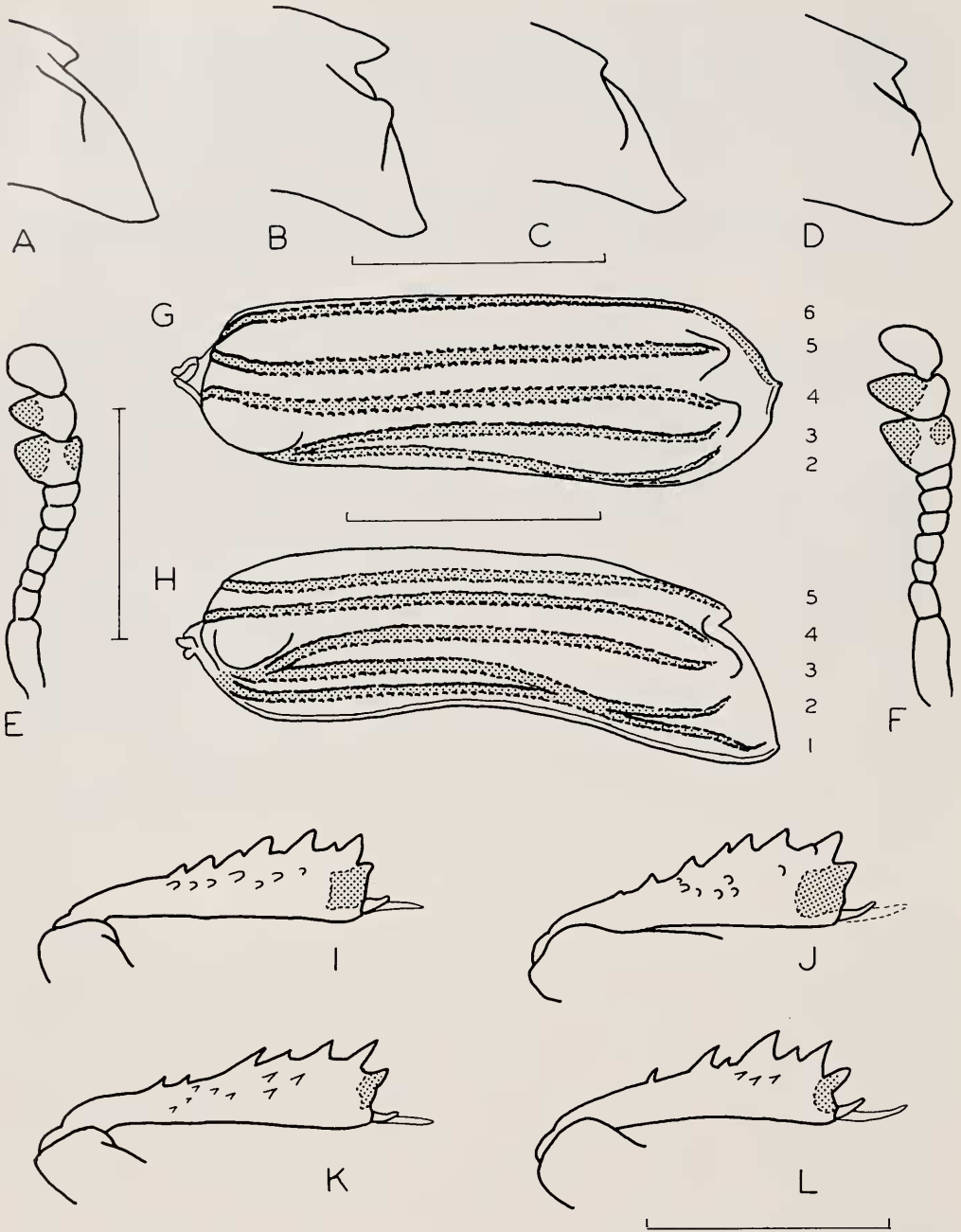


FIGURE 1. Profile of elytral tubercles and declivities of (A) *D. hughleechi* male, (B) *D. wrightii* male, (C) *D. hughleechi* female, (D) *D. wrightii* female, with 10 mm scale for Figs. A–D. Fig. (E) antenna of *D. hughleechi*, with 3 mm scale, (F) of *D. wrightii*, to same scale as E. Fig. (G) left elytron of *D. wrightii* from above, (H) same, obliquely from side (numbers to right of both figures designate costae), scale equals 10 mm. Fig. (I) anterior face of hind tibia of female *D. hughleechi* and (J) male; (K) same, of *D. wrightii* female and (L) male, with 5 mm scale for Figs. I–L.

enclosing a long subcostal cell; 5 terminates on the narrow, raised inner tubercle above the declivity (Figs. 1G, 1H); 6 extends forward along the suture, diverging anteriorly somewhat before the apex of the scutellum, margins raised and somewhat widened along declivity. Dorsal intervals closely, coarsely punctate, the raised polished interstic-



es giving the appearance of being irregularly linked; elytral apices triangularly divergent, more or less sinuate laterally.

Legs subequal in length; fore-tarsus (not including claws) shorter than tibia; mid- and hind-tarsi subequal to their tibiae; tibiae flattened, with 8–12 blunt, subtriangular teeth on outer margin (Figs. 1I, 1J); posterior surface of anterior tibia with 2–4 broadly-based, small denticles ( $\bar{m} = 2.8$ ); anterior surface of mid-tibia with 6–13 ( $\bar{m} = 8.8$ ), of hind-tibia with 0–10 ( $\bar{m} = 5.3$ ) blunt, low-lying tubercles, more or less in lines, 1–3 tubercles in breadth along apical 4/5ths of tibiae (Figs. 1I, 1J); asymmetry in numbers and disposition of tubercles and marginal teeth of right and left tibiae the rule; a conspicuous, smooth, polished area behind anterior apical spine and outer apical tooth of hind-tibia (Figs. 1I, 1J), a smaller, more irregular area on mid-tibia; posterior surfaces of mid- and hind-tibiae with abundant, long recumbent hair directed apically.

Pro-, meso-, metasternum and abdominal sternites finely asperate at bases of hairs; metasternum appears strigate in part, metepisternum finely shagreened. Fifth visible abdominal sternum truncate or slightly concave on apical margin, marginate, with the margin broadened and polished along medial fourth.

*Secondary sexual characteristics.*—Male similar in size and overall morphology to female but differing as follows: clypeus and front of head coarsely punctate, punctures separated by a diameter or more (clypeus and frons of female closely and conspicuously asperate); pronotal rasp-like tubercles on flanks and anterior dorsum of male more strongly developed; inner (“sutural”) posterior tubercle of elytron pointed, noticeably projecting above elytral declivity but blunt, not or barely projecting in female (*cf.* Figs. 1A, 1C); declivity shining, sparsely punctate (in female dull, densely rugose and asperate); tibiae broader apically (*cf.* Figs. 1I, 1J), with dense long hairs on posterior surfaces of mid- and hind-tibiae, those of hind-tibiae very dense (inner surfaces of mid- and hind-tibiae of female alike, hairs abundant but not dense); posterior surfaces of joints 2–4 of mid-tarsi (and probably also of hind-tarsi, as is the case in *D. wrightii*) with posteriorly-directed fans of long, stiff, hairs (female with relatively sparse, very short hairs); hairs on disc of the 5th visible abdominal sternite not abruptly longer and nearly erect (abruptly longer and erect or suberect in female). It is to be noted that a hairy frons, while common among female Bostrichinae, is an uncommon attribute of males (Lesne 1924).

*Etymology.*—The specific epithet *hughleechi* is in honor of Mr. Hugh B. Leech, now Curator Emeritus of Coleoptera at the California Academy of Sciences who, over very many years, has generously helped, counseled, and befriended countless coleopterists, among whom I have had the great good fortune to be one.

*Holotype.*—Male, 37.5 mm long, from Mexico, State of Tamaulipas, 15 miles west of Antigua Morelos [hence, near Nuevo Morelos—see below] ex palm log, Nov. 10, 1946, E. S. Ross collector. Collection of the California Academy of Sciences, San Francisco, type number 15290. The type was evidently taken from the log as a dead specimen; it is nevertheless the individual in best condition of all 5 specimens available. It lacks palpi, joints 9–10 of both antennae, the right mid-tibia and tarsus, and both hind tarsi.

*Allotype.*—Female, 35.4 mm long; from Mexico, State of San Luis Potosi, El Salto Falls [Salto de Agua, elevation 402 m (1320 ft), April 22, 1965, E. M. Collins, Jr., collector. Florida State Collection of Arthropods, Gainesville. The allotype lacks the right maxillary palp, both antennae beyond joints 2, right anterior tarsal joints 4–5, and the left posterior tarsus.

*Paratypes.*—One female, Mexico, State of Tamaulipas, near Nuevo Morelos, dead when collected, in poor condition, ex log of *Sabal texana* (Cook) Becc. (determined as *S. mexicana* Cook, a junior synonym [Bailey 1961], by J. F. Hart of Ciudad Valles, San Luis Potosi, Mexico), Nov. 18, 1948, Hugh B. Leech and E. S. Ross collectors, California Academy of Sciences.

Two additional females, of same label data as the allotype, Florida State Collection of Arthropods, Gainesville, lacking antennae, one or more palps and legs.

*Comment.*—The three specimens from the Florida State Collection of Arthropods

came loose during shipment to me. The broken palps, antennae, legs, and parts of legs were recovered; though suitable for study, they cannot with certainty be matched to individual specimens. They are now collectively preserved in a gelatin capsule accompanying the specimens, labelled and mounted on a pin.

*Recognition of D. hughleechi.*—Though not easily distinguished from all specimens of *D. wrightii* without the use of a lens, *D. hughleechi* is nevertheless strikingly different. In descending order of ease in determination, it may be separated by (1) the concavity of its scutellar disc (convex in *D. wrightii*), (2) the large, subrectangular, slightly convex, polished apical area on the anterior face of the hind tibia (a lesser one on the mid-tibia) (*cf.* Figs. 1I, 1J, with 1K, 1L), (3) the abundant long hairs on clypeus, frons and occiput, recognizable by their stumps when abraded (in *D. wrightii* there are few long hairs on the clypeus or supraorbitally, and the hairs of the occiput, which are rarely lost, are numerous but inconspicuous, very short, fine and decumbent), (4) the strongly wrinkled and deeply incised reticulation of the humeral umbone, (5) the inner and outer elytral tubercles above the declivity are less well-developed (*cf.* Figs. 1A, 1C with 1B, 1D, 1G, 1H), (6) first joint of the antennal club (joint 8) has its superior dorsal angle  $\geq 78^\circ$  (in *D. wrightii* ca.  $65^\circ$ , *cf.* Figs. 1E, 1F), (7) the outer marginal teeth of the tibiae are broader, blunter ( $\bar{m}$  angle =  $41^\circ$ , range  $31^\circ$ – $51^\circ$ , Figs. 1I, 1J; in *D. wrightii*  $m = 29^\circ$ , range  $25^\circ$ – $37^\circ$ , Figs. 1K, 1L; also Lesne, 1909, pl. 14, figs. 3, 4), and (8) the tubercles on the anterior face of the mid- and hind-tibiae, and posterior face of the anterior tibia, are decumbent and blunt (spinulose and suberect in *D. wrightii*; *cf.* Figs. 1I, 1J with 1K, 1L).

The costae on the flanks (especially costa 3) of the elytra in *D. hughleechi* are not so strongly defined, although I would expect some individuals in a larger sample to have them equally developed to those of *D. wrightii*. Horn (1886) overlooked costae 2, 3 and 6 when describing *D. wrightii*, and Fisher (1950) noted only “four or five obtusely rounded, longitudinal costae.” Admittedly all six costae are not definable at a glance. But if an elytron is removed from a specimen, and a fine pin is passed through each of the six tracheae running lengthwise and close to the inner surface, the resulting six (pin-) holes on the outer surface of the elytron immediately flag the costae. Once seen in this manner, they can be made out in all specimens of both species seen by me ( $n = 5$  and 76 respectively) and correspond precisely with those figured by Lesne (1898:446, fig. 49) for *Bostrichus capucinus* Linn.

*Diagnosis of the genus Dinapate.*—Fisher’s (1950, pp. 51–52) fine diagnosis requires only three emendations now that a second species is known: (1) “Scutellum small, quadrate, *strongly elevated*:—delete “strongly elevated”; (2) “tibiae . . . armed on exterior margins with a few large, triangular teeth”—delete “few”; (3) “*posterior tarsi as long as tibiae*”—replace with: mid and posterior tarsi subequal to tibiae.

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records that would establish the issue-dates of the Transactions of the American Entomological Society for 1886, and for correspondence between Wright and Horn (of which none seems to remain), as well as Mr. Donald Azuma, at the same institution, who searched for additional fragments of *Dinapate* upon which Horn based his new genus and species. Professor R. Ruibal and Mrs. G. Gordh kindly rendered the title and abstract in Spanish.

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